

What is claimed :

1 1. A torque-transmitting assembly comprising:

2 a) a female coupling member with a bore;

3 b) a radially flexible member, received within the bore, defining a hollow shape with an
4 opening; and

5 c) an elongated shaft member made of a super-elastic alloy, received within the opening,

6 whereupon relative motion among at least two of the members causes the radially
7 flexible member to contact the shaft, inducing a super-elastic activation in the shaft that
8 urges the shaft and radially flexible member into surface-to-surface contact, securing the
9 members together in a fixed relative position.

1 2. The assembly of Claim 1 wherein the radially flexible member has an external surface
2 that frictionally engages the bore upon relative motion.

1 3. The assembly of Claim 1 wherein the shaft is tubular with a cannulation.

1 4. The assembly of Claim 3 wherein the bore of the female coupling member further
2 comprises a cannulation aligned with the shaft cannulation, for common passage of a
3 guide wire there through.

1 5. The assembly of Claim 1 further comprising an inter-positional polymer sleeve for
2 transmitting bending stress in the assembly.

1 6. The assembly of Claim 1 wherein the contact occurs in one or more areas that
2 frictionally carries the applied torque.

- 1 7. The assembly of Claim 6 wherein the contact area is calibrated so that the contact slips
2 at a preset torque before the failure strength of the shaft is reached.
- 1 8. The assembly of Claim 1 wherein the female coupling member further comprises a
2 counter-bore and the radially flexible member has an exterior surface adapted for
3 engagement within the counter-bore.
- 1 9. The assembly of Claim 8 wherein the radially flexible member is compressed within
2 the counter-bore.
- 1 10. The assembly of Claim 1 wherein the female coupling member is a fitting that
2 connects the assembly to a cutting tool-bit or powered instrument.
- 1 11. The assembly of Claim 1 wherein the female coupling member further comprises a
2 fitting with a cutting tool-bit.
- 1 12. The assembly of Claim 11 wherein the assembly is further connected to a powered
2 instrument.
- 1 13. The assembly of Claim 1 wherein the radially flexible member is a split collet.
- 1 14. The assembly of Claim 1, the radially flexible member being in the form of a collar
2 and made of super-elastic alloy, wherein the relative motion further induces a super-
3 elastic activation of the collar.
- 1 15. The assembly of Claim 1 wherein the collar further comprises a washer.
- 1 16. The assembly of Claim 15 wherein the collar further comprises a series of washers.
- 1 17. The assembly of Claim 14 wherein the super-elastic alloy is a nickel-titanium alloy.
- 1 18. A torque-transmitting coupling assembly comprising:

1 26. The assembly of Claim 18 wherein the collet further comprises a cutting tool-bit.

1 27. The assembly of Claim 26 further coupled to a powered instrument.

1 28. A torque-transmitting coupling assembly comprising:

2 a) a fitting member formed with a counter-bore;

3 b) a collar member made of super-elastic alloy, having an exterior surface and an
4 opening, the collar being located in the counter-bore; and

5 c) an elongated shaft member made of a super-elastic alloy, received within the opening;

6 whereupon relative motion between the fitting and the collar causes the collar to
7 contact the shaft, inducing a super-elastic activation in the shaft that engages the shaft
8 and collar into surface-to-surface contact, securing the members together in a fixed
9 relative position.

1 29. The assembly of Claim 28 wherein engagement of the exterior surface with the
2 counter-bore super-elastically compresses the opening against the shaft.

1 30. The assembly of Claim 29 wherein the collar further comprises a washer.

1 31. The assembly of Claim 30 further comprising a series of washers.

1 32. The assembly of Claim 28 wherein the super-elastic alloy is a nickel-titanium alloy.

1 33. The assembly of Claim 28 wherein the shaft is tubular with a cannulation.

1 34. The assembly of Claim 33 wherein the fitting has a cannulation aligned with the
2 shaft cannulation, for common passage of a guide wire there through.

- 1 35. The assembly of Claim 28 further comprising an inter-positional polymer sleeve for
2 transmitting bending stress in the assembly.
- 1 36. The assembly of Claim 29 wherein the frictional engagement occurs along one or
2 more contact areas that frictionally carries the applied torque.
- 1 37. The assembly of Claim 36 wherein the contact area is calibrated so that the coupling
2 slips at a preset torque before the fatigue strength of the shaft is reached.
- 1 38. The assembly of Claim 28 wherein the fitting is connected to a cutting tool-bit or
2 powered instrument.
- 1 39. The assembly of Claim 28 wherein the fitting further comprises a cutting tool-bit.
- 1 40. The assembly of Claim 39 further coupled to a powered instrument.
- 1 41. A method of forming a torque-transmitting assembly, comprising the steps of:
2 a) providing a female coupling member with a bore;
3 b) providing a radially flexible member with an external surface and an opening, situating
4 the radially flexible member within the bore
5 c) providing an elongated shaft member made of a super-elastic alloy, received within the
6 opening; and
7 d) relatively moving at least two of the members, causing the radially flexible member to
8 contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and
9 radially flexible member into surface-to-surface contact, securing the members together
10 in a fixed relative position.

- 1 42. The method of Claim 41 wherein step d) further comprises frictionally engaging the
2 members along a contact area that carries the applied torque, the contact area being
3 calibrated to slip at a preset torque before the failure strength of the shaft is reached.
- 1 43. The method of Claim 42 further comprising the steps of providing the female
2 coupling member with a counter-bore, providing the radially flexible member in the form
3 of a collar made of super-elastic alloy and inducing a super-elastic activation in the
4 collar.
- 1 44. The method of Claim 42 wherein step a) further comprises providing a radially
2 flexible member in the form of a split collet.
- 1 45. A flexible surgical reamer having a torque-transmitting assembly and comprising:
2 a) a fitting member formed with a counter-bore and including a cutting tool-bit;
3 b) a collar member made of super-elastic alloy, located in the counter-bore; and
4 c) an elongated shaft member made of a super-elastic alloy, adapted for receipt within the
5 collar;
6 whereupon relative motion among the members causes the opening to contact the
7 shaft, inducing a super-elastic activation in the shaft that urges the shaft and the collar
8 into surface-to-surface contact, securing the members together in a fixed relative position.
- 1 46. The reamer of Claim 45 wherein the collar is an annular member.
- 1 47. The reamer of Claim 46 wherein the collar further comprises a washer.
- 1 48. The reamer of Claim 47 wherein the collar further comprises a series of washers.
- 1 49. The reamer of Claim 48 wherein the collar is pre-assembled with the fitting.

- 1 50. The reamer of Claim 45 further comprising an inter-positional polymer sleeve for
2 transmitting bending stress in the assembly.
- 1 51. The reamer of Claim 45 wherein the contact occurs along an area that frictionally
2 carries the applied torque.
- 1 52. The reamer of Claim 51 wherein the contact area is calibrated to slip at a preset
2 torque before the failure strength of the shaft is reached.
- 1 53. The reamer of Claim 45 wherein the shaft is tubular, with a cannulation.
- 1 54. The reamer of Claim 53 wherein the fitting has a cannulation that aligns with the
2 shaft cannulation for passage of a guide wire through the reamer.
- 1 55. A flexible surgical reamer having a torque-transmitting assembly and comprising:
2 a) a radially flexible member having a split collet with an exterior surface and an
3 opening, and including a cutting tool-bit;
4 b) an elongated shaft member made of a super-elastic alloy, received within the opening;
5 and
6 c) a sleeve having a bore that receives the exterior surface,
7 whereupon relative motion among the members causes the opening to contact the shaft,
8 inducing a super-elastic activation in the shaft that urges the shaft and the collet into
9 surface-to-surface contact, securing the members together in a fixed relative position.
- 1 56. The reamer of Claim 55 wherein the exterior surface is compressed by the bore,
2 further contracting the opening against the shaft to induce the super-elastic activation.
- 1 57. The reamer of Claim 55 wherein the shaft is tubular with a cannulation for passage of
2 a guide wire there through.

1 58. The reamer of Claim 56 wherein the opening interferingly receives the shaft and is
2 expanded to compress the exterior surface against the bore.

1 59. The reamer of Claim 55 further comprising an inter-positional polymer sleeve for
2 transmitting bending stress in the assembly.

1 60. The reamer of Claim 55 wherein the contact occurs along an area that frictionally
2 carries the applied torque.

1 61. The reamer of Claim 60 wherein the contact area is calibrated to slip at a preset
2 torque before the failure strength of the shaft is reached.

1 62. The reamer of Claim 61 wherein the shaft is further connected to a powered
2 instrument.

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